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# Frost Damage to Red Pine Conelets

During a study of seed and cone insects attacking red pine in northern Wisconsin in 1962, extensive conelet mortality was observed in an otherwise healthy, 25-year-old plantation. Careful dissections ruled out insects and diseases as possible causes. Although it is known that lack of pollination will result in similar mortality,[1] this, too, was ruled out because of the peculiar stratification of the dead conelets. Below a certain level in the crown, all the conelets were dead; above that level, all were alive.

A check of the literature revealed observations of Scotch pine conelets killed by low temperature during the pollination period.[1] Weather records in northern Wisconsin showed that freezing temperatures had occurred in the study area in early June. The stage of development of the dead conelets showed that they had died about that time. It seemed probable that these temperatures were the cause of mortality.

To test this hypothesis further, measurements of the crown level separating live and dead conelets were made on trees growing in a depression and on an adjacent slope within the plantation. To facilitate these measurements, a base point with a hypothetical elevation of 0.0 feet was established in the plantation, and base elevations of 33 sample trees in a 5-acre, rectangular area were determined by leveling. The margin of error in the tree-base elevations is approximately 1 foot. The total height and the height of dead conelets were measured for each tree and converted to elevation.

The data were plotted and regression lines fitted to show a profile of the stand and conelet mortality (fig. 1). Although tree-top and tree-base elevations are nearly parallel, the line separating live and dead conelets is roughly horizontal. Nearly all of the conelets were killed in trees located on low ground, whereas trees located on high ground suffered conelet mortality only in the lower half of the crowns. This pattern is characteristic for frost damage. The low temperature had no apparent effect on the vegetative growth of the trees.

Thus, circumstantial evidence is very strong that young trees may exhibit a significant amount of cone mortality due to late spring frosts. This may be an important consideration in the establishment of seed orchards. Specifically, trees planted in depressions may not produce seed as early as trees on higher ground.

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[1] *Sarvas, Risto. Investigations on the flowering and seed crops of Pinus silvestris. Helsinki, Finland. 1962.*

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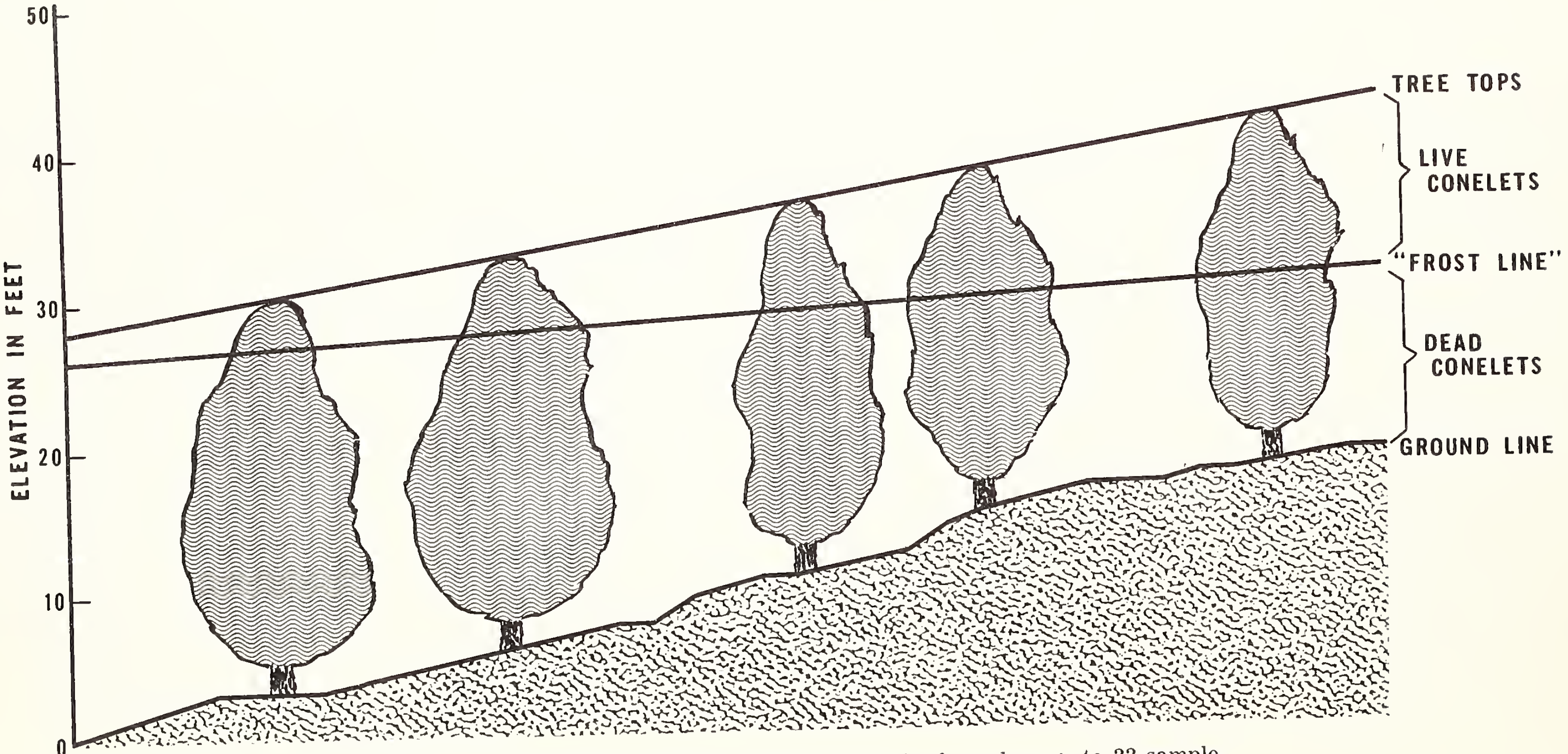

FIGURE 1. — A profile of conelet mortality caused by frost damage to 33 sample red pine trees. Conelets above the "frost line" were living; below it they were dead.